

Amendments to the Claims

What is claimed is:

Claim 1 (Currently amended): A method of providing reasonable assurance of a completed vend of a vendible item in a vending machine comprising:

- a. placing a set of optical emitters at spaced apart locations on one side of a dispensing area of the vending machine, the emitters each having on and off states, and when in the on state, emitting optical energy of predetermined characteristics, and an emitter beam spread;
- b. placing a set of optical detectors at spaced apart locations on a generally opposite side of the dispensing area in the emitter beam spread for each emitter of the set, each detector having on and off states, the on state adapted for sensing of at least a threshold level of optical energy of said predetermined characteristics from a detector viewing angle including each emitter of the set;
- c. holding all the emitters in the off state for a time period, monitoring the state of all the detectors and if any detector indicates an on state generating an output signal to indicate a possible error condition;
- d. turning an emitter on for a time period, monitoring the state of all the detectors and if any detector does not indicate an on state, generating an output signal to indicate a completed vend;
- e. repeating steps c. and d. for each other emitter;
- f. communicating any output signal to a master controller of the vending machine.

Claim 2 (Original): The method of claim 1 wherein the emitters emit infrared energy.

Claim 3 (Original): The method of claim 2 wherein the emitters are LEDs.

Claim 4 (Previously presented): The method of claim 3 wherein the LEDs' output is modulated to a frequency range.

Claim 5 (Original): The method of claim 4 wherein the detectors are adapted to detect IR energy in the frequency range.

Claim 6 (Original): The method of claim 1 wherein there are five emitters.

Claim 7 (Original): The method of claim 6 wherein there are five detectors.

Claim 8 (Original): The method of claim 1 wherein the emitters are spaced approximately an inch apart.

Claim 9 (Original): The method of claim 8 wherein the detectors are spaced approximately an inch apart.

Claim 10 (Original): The method of claim 1 wherein the emitters are spaced apart from the detectors at least approximately ten inches and no more than approximately three feet.

Claims 11-12 (Cancelled).

Claim 13 (Original): The method of claim 1 wherein the output signal is used to control a vending regimen by the vending machine.

Claim 14 (Original): The method of claim 1 wherein the sequence the emitters of the set are turned on is other than in seriatim.

Claim 15 (Original): The method of claim 1 further comprising repeating steps c., d., and e. after each of the emitters of the set has been turned on.

Claim 16 (Original): The method of claim 1 wherein an emitter is turned on for a different period of time than another emitter.

Claim 17 (Original): The method of claim 16 wherein the said emitter which is turned on a different period of time is an end-most emitter of the set of emitters.

Claim 18 (Original): The method of claim 1 wherein the output signal is retriggerable in steps c. or d.

Claim 19 (Original): The method of claim 1 wherein the time to cycle through steps c., d., and e. is designed to be less than estimated time for a vendible item to drop between the emitters and detectors in free fall.

Claim 20 (Currently amended): An apparatus to provide reasonable assurance of completion of a vend of a vendible item from a vending machine, comprising:

- a. a first support member upon which is mounted a set of optical emitters in spaced apart locations, each emitter having a beam spread;
- b. a second support member upon which is mounted a set of optical detectors in spaced apart locations, each detector being positioned in the beam spread of all emitters and having a viewing angle including all emitters of the set;
- c. a controller operatively connected to each emitter and detector, the controller programmed to:
 - i. control on and off of individual emitters for a period of time in a predetermined sequence, separated by a period of time all the emitters are off;
 - ii. monitor a triggering threshold of all the detectors during the time all the emitters are off, the triggering threshold adapted to sense at least a certain level of optical energy of the type emitted by the emitters;
 - iii. generate an output signal if:
 - 1. any detector triggers during any period all the emitters are off to indicate a possible error condition; or
 - 2. any detector does not trigger during any period an emitter is on to indicate a completed vend;
- d. an interface adapted for communication of the output signal to a master controller board of a vending machine.

Claim 21 (Original): The apparatus of claim 20 wherein the first and second support members comprise a circuit board.

Claim 22 (Original): The apparatus of claim 20 wherein the first and second support members have perimeter dimensions that do not exceed approximately several inches by one-half of foot.

Claim 23 (Original): The apparatus of claim 20 wherein there are five emitters.

Claim 24 (Original): The apparatus of claim 20 wherein there are five detectors.

Claim 25 (Original): The apparatus of claim 20 wherein the emitters are spaced from one another approximately one inch.

Claim 26 (Original): The apparatus of claim 25 wherein the detectors are spaced from one another approximately one inch.

Claim 27 (Original): The apparatus of claim 20 wherein the controller is a microprocessor.

Claim 28 (Original): The apparatus of claim 20 wherein the output signal is communicated to a interface to a master controller board of a vending machine.

Claim 29 (Original): The apparatus of claim 20 in combination with a vending machine.

Claim 30 (Currently amended): A method of optically monitoring for a vend of a vendible product in a vending machine comprising:

- a. spacing out several emitters on one side of a vend area of the vending machine, the emitters adapted to emit electromagnetic energy of a restricted beam width and predetermined wavelength, each emitter having a beam spread;
- b. spacing out several optical detectors on another side of the vend area, the optical detectors adapted to turn on when receiving electromagnetic energy of the predetermined wavelength over a threshold value, each detector being positioned in the beam spread of all emitters of the set and having a viewing angle including all emitters of the set;
- c. upon a vend instruction to the vending machine, monitoring for a vend by an algorithm adapted to:
 - i. turn on the emitters in a predetermined sequence for predetermined time periods separated by all the emitters turned off for a predetermined time period;
 - ii. check if all the detectors are on during the time periods any emitter is on;
- d. if any detector does not turn on during the time period any emitter is on, generating a signal to the vending machine indicative that a vend has occurred;
- e. if any detector turns on during the time all the emitters are off, generating a signal to the vending machine indicative of a possible error.

Claim 31 (Original): The method of claim 30 wherein the signal comprises a pulse of an output line.

Claim 32 (Original): The method of claim 30 further comprising instigating a vend correction regimen if no signal is sent to the vending machine during an instructed vend cycle.

Claim 33 (Original): The method of claim 30 further comprising conducting a test of detector operation before each emitter is turned on.

Claim 34 (Original): The method of claim 30 further comprising generating a signal if any detector is on during the time all emitters are off.

Claim 35 (Original): The method of claim 30 further comprising repeating step c for each emitter in a predetermined sequence.

Claim 36 (Original): The method of claim 36 further comprising generating the output signal for a time period.

Claim 37 (Original): The method of claim 37 wherein the time period for generating the output signal is longer than the time to turn on and off all emitters one time.

Claim 38 (Original): The method of claim 30 further comprising five emitters and five detectors, the emitters spaced apart from each other in generally a row, the detectors spaced apart from each other in generally a row, and the emitters and detectors are spaced from each other across a dispensing area generally in alignment.

Claim 39 (Previously presented): The method of claim 30 further comprising communicating the signal to a master controller board of a vending machine.

Claim 40 (Currently amended): An apparatus for optically monitoring optically monitoring for a vend of a vendible product in a vending machine comprising:

- a. a set of several emitters spaced apart on one side of a vend area of the vending machine, the emitters adapted to emit electromagnetic energy of a restricted beam width and predetermined wavelength, each emitter having a beam spread;
- b. a set of several optical detectors spaced apart on another side of the vend area, the optical detectors adapted to turn on when receiving electromagnetic energy of the predetermined wavelength over a threshold value, each detector being positioned in the beam spread of all emitters of the set and having a viewing angle including all emitters of the set;
- c. a microprocessor operatively connected to each emitter and detector and having a program which, upon a vend instruction to the vending machine, monitoring for a vend by an algorithm adapted to:
 - i. turn on the emitters in a predetermined sequence for predetermined time periods separated by all the emitters turned off for a predetermined time period;
 - ii. check if all the detectors are on during the time periods any emitter is on;

- iii. if any detector does not turn on during the time period any emitter is on, generating a signal to the vending machine indicative that a vend has occurred;
- iv. if any detector turns on during the time all the emitters are off, generating a signal to the vending machine indicative of a possible error.

Claim 41 (Previously presented): The apparatus of claim 40 further comprising a timer to time on and off states of the emitters.

Claim 42 (Original): The apparatus of claim 40 further comprising a timer to time the length of time of the generated signal.

Claim 43 (Original): The apparatus of claim 40 further comprising a modulator to modulate the electromagnetic energy of the emitters.

Claim 44 (Original): The apparatus of claim 40 wherein the signal is adapted for communication to a vending machine.

Claim 45 (Original): The apparatus of claim 40 wherein the signal is adapted for communication to a master controller board of a vending machine.

Claim 46 (Original): The apparatus of claim 40 wherein the signal turns a transistor on or off.

Claim 47 (Original): The apparatus of claim 40 wherein the signal operates a relay.

Claim 48 (Original): The apparatus of claim 40 in combination with a vending machine.

Claim 49 (Previously presented): The apparatus of claim 48 wherein the vending machine is a snack vending machine with multiple rows and columns of dispensing mechanisms.

Claim 50 (Currently amended): A system for optically monitoring optically monitoring for a vend of a vendible product in a vending machine comprising:

- a. a dispensing area in the vending machine;
- b. a master controller controlling dispensation of vendible products in the vending machine;
- c. a set of several emitters spaced apart on one side of the vend area of the vending machine, the emitters adapted to emit electromagnetic energy of a restricted beam width and predetermined wavelength, each emitter having a beam spread;
- d. a set of several optical detectors spaced apart on another side of the vend area, the optical detectors adapted to turn on when receiving electromagnetic energy of the predetermined wavelength over a threshold value, each detector being positioned in the beam spread of all emitters of the set and having a viewing angle including all emitters of the set;
- e. a microprocessor operatively connected to each emitter and detector and having a program which, upon a vend instruction to the vending machine monitoring for a vend by beginning a algorithm adapted to:

- i. turn on the emitters in a predetermined sequence for predetermined time periods separated by all the emitters turned off for a predetermined time period;
- ii. check if all the detectors are on during the time periods any emitter is on;
- iii. if any detector does not turn on during the time period any emitter is on, generating a signal to the vending machine indicative that a vend has occurred;
- iv. if any detector turns on during the time all the emitters are off, generating a signal to the vending machine indicative of a possible error.

Claim 51 (Previously presented): The system of claim 50 wherein the algorithm further comprises an initialization of on and off times for the emitters.

Claim 52 (Previously presented): The system of claim 50 wherein the algorithm further comprises an initialization of on time for the generated signal.